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V.—*On the Archæology of Bronze.* By H. H. HOWORTH, Esq.

[*Read February 26th, 1867.*]

It is only a veteran in science who can safely deal in generalities. He is rightly privileged to sum up the results of long observation, and may justly suspect any intrusion into this province by those who lack his training, who have served but a short apprenticeship to the collection of facts, and whose words are of slight authority. To this class I belong, and with such credentials alone do I ask for your confidence. If there be nothing new in what I have to say, (and looking at the great names who have been before me on the same track it would be presumptuous in me to say there is,) the conclusions I have come to are hardly those of the orthodox school of archæologists; and if they lack the interest of being paradoxically original or ingenious, they are, I trust, free from the charge of being either obsolete or trite. I have been indebted to so many authorities, that to select any for special mention is perhaps invidious, but my acknowledgments are especially due to Sir John Lubbock; to Hodgson, the historian of Northumberland, who wrote a masterly paper on ancient arms in the *Archæologia Æliana*; and to the pages of the *Revista Minera*, and the *Revue Archéologique*.

Philosophy is beginning to endorse the guess of the poet, that oblivion is a myth, that every change and every step in the progress of the universe leaves a footprint behind it, and that we need but the key to enable us to read the history of the past in the ruins around us. Every day some new symbol is deciphered, and every day some rusty decaying trinket is made to tell us more about the earlier days of which we know so little, enabling us to see farther into the mists which hang about the origines of mankind—a mystery of surpassing interest, which will not be resolved by the *à priori* guesses and theories of monogenists and polygenists, but by slowly working backwards from what we know, and which may condone a new venture on a fruitful but supposed well-gleaned field.

Bronze is a compound, in varying proportions, of copper and tin, and objects made of it are found distributed over wide areas of the earth's surface, and through a long series of years. Its composition, the form and ornamentation of objects made of it, and the limits in time of its especial use for cutting implements, in so far as they throw a light on ethnology, are the

subjects I propose to treat of in turn. Copper is a metal of wide distribution, found in almost every primitive mountain chain, and easily accessible. The Egyptians worked mines of it in the stony Arabia at a very early period; the Phœnicians in Cyprus, Asia Minor, Spain, and the Mediterranean islands; the Greeks perhaps in Thrace and in Greece; the Romans in Tuscany, and generally in the footsteps of the Phœnicians and their successors, the Carthaginians. Its use was apparently coeval with, and confined to, its employment as a component of bronze, and objects made of it in its pure state are only found in exceptional localities. Its sources have not been the subjects of much discussion, nor do they seem to point to any important lessons.

Tin is a metal of more limited distribution in accessible quantities. Its chief sources now are Cornwall, Bohemia, and Saxony, the Malayan Peninsula and islands, and Australia. That these, or some of them, have *always* been its chief sources, has been too readily admitted. Tin deposits have been traced in the following places: Greenland, Sweden, Ireland, Cornwall and Devon, Gallicia, the Asturias and Biscay, Brittany, Bohemia and Saxony, Northern Africa, Siberia, China, Japan, Malacca, Sumatra and the adjacent islands, Australia, Chili, Peru, Mexico, California and Massachusetts. *Siberia, Australia, and Greenland may be at once dismissed*; specimens of tin ore from all three places may be found in the British Museum, but they are interesting only to the mineralogist, and the deposits have been discovered within living memory. On the American continent tin has been long worked. The Spaniards on their arrival found a currency of tin in use among the natives, similar to that described by the early travellers as also found in Sumatra. From Peru and Mexico have been derived objects of bronze which bear a very close likeness to those found in Europe; axes and chisels of this metal were in use among the races south of the Rio Grande on the arrival of the Spaniards, and many are said to be found among the mines north of that river; copper would seem to have been used at the same time, as is related by De Sotas, the Spaniards were told this was derived from a northern province called Chisca. However this may be, the primitive race who built the huge mounds and other monuments of the United States would seem to have been unacquainted with the use of bronze or iron, and Mr. Squiers says that from the structure and peculiarities of the copper used, American archæologists have conclusively shewn that it was derived from the deposits about Lake Superior; at the same time the obsidian of which so many objects were made must have been derived from

Mexico. The remoteness of the mines of Tasco whence tin was then derived was, perhaps, the sole cause of the use of unalloyed copper in the northern regions; the nearer we get to those mines the more abundant do our specimens of bronze articles become. Whence the knowledge of its metallurgy was derived, and when, is at present a riddle, and awaits the determination of the source, or rather the sources (for they would appear to have been many and various), of the other elements of civilisation which abound in Central America.

China and Japan, standing apart from the rest of the world, and with a history requiring a distinct criticism and point of view, are generally ignored in treating the currents of the world's progress. Many points of contact linking the east and west have consequently been overlooked, and antiquaries been unnecessarily startled by the discovery of Chinese seals in Ireland, and porcelain bottles in Egypt. An overland trade between Serica and the Eastern borders of Europe has existed, at least, since the time of Augustus, and, no doubt, much longer. About that period a new compound called orichalcum was introduced into Europe, a mixture of copper and zinc, in fact, our modern brass. It displaced in some measure the use of bronze at Rome. This compound has been known and employed in China from time immemorial, and there can be little doubt that it was derived thence by some caravan trader, much more probable than that it should have been an independent discovery. Pliny expressly names a metal he calls *ferrum sericum*, which may be brass, or may be the compound known as white copper or tuttenague, apparently the *ferrum candidum* of the author of the Aristotelian collection of wonderful reports, of which a present of a hundred talents was made to Alexander in India. This in a parenthesis. Kämpfer, writing in 1690, says that Japan then produced a little tin of excellent quality. Its chief supply now is imported by the Chinese, who very probably introduced the manufacturing of bronze, which is, however, not very important, brass being chiefly employed. Grosier judges that mines of tin must exist in the interior of China from its cheapness, and by the missionary geographers. Karchin is mentioned as the richest in metals of the Mongolian provinces, containing *inter alia* mines of excellent tin. These sources, however abundant, are practically unknown to us, and we know that the seaboard, at least of China, is practically supplied from another quarter. According to Mr. Crawford, whose authority on such a subject is paramount, the Malacca coast, on its discovery by the Portuguese, was found crowded with Hindoo and Chinese craft. The travellers Louis Barthema, Mendez Pinto, and Barbosa all mention tin as an article of commerce in these

seas; and the calendar of the colonial series of state papers contains similar testimony, though it is strange that among the stores which English ships generally loaded before their departure from England some ingots of tin are generally mentioned, which would hardly have been the case if it had then been very cheap in the east. The area over which tin deposits have been found is limited to the peninsula of Malacca, the countries of Tavoy and Siam in the north, and Sumatra and the small islands between it and the mainland, more especially Banca. In this area it is found abundantly. Borneo and Celebes are mentioned as exporting tin, but the report is improbable. The best accounts of these mines I know will be found in *Newbold's History of the Straits Settlements*, and in a special report on them by H. W. Voysey in the eighteenth volume of the *Asiatic Researches*.

The mines of Banca are said to have been discovered in 1710 by the burning down of a house. They are now the richest and most productive in the world, except those of Cornwall. On the mainland, the Portuguese found tin being worked by Chinese emigrants when they first arrived. The Malays settled here in 1160, and no doubt supplied the Javanese and Sumatrans with it from that time. Before them the Arabs, from whom they borrowed their literature, and very probably their knowledge of metallurgy, were the chief merchants of Southern Asia, and in the seventh and eighth centuries their vessels swarmed on the whole southern seaboard of that continent. Among other articles they would seem to have supplied the Caliphate with tin, and a probable relic of the trade is traceable in the fact mentioned by Gmelin, that in his day (1723) the Persians derived their tin from India. It has been warmly debated whether the ancients knew of these deposits. It has been, however, pretty nearly decided that they did, but that they were not then generally worked, for we have no tradition of a *trade* in tin in these seas in any Greek or Roman author. Perak is said to be the Temala of Ptolemy, tima being the Malay term for tin; Calang, another place noted for its mines, is supposed to be the Malaion of the same author, and the Malaya Calam of the Hindoos. Calang is likewise a name for tin.

Diodorus says that India contained mines of many metals, among them tin, while Pliny expressly says that it did not. Stephanus of Byzantium, on the authority of the Bassarica of Dionysius, mentions an island Cassitira in the Indian Sea, where tin was obtained. Lastly, the Egyptian author of the *Periplus of the Erythrean Sea* states that tin was imported into the following places:—Port Avalites in Abyssinia, Cane on the Coast of Arabia, *whither it was brought from Egypt*, and two Indian

emporium, Barygaza at the mouth of the Nerbudda, and Bacare on the Malabar coast. Mr. Crawford, in criticising Dr. Vincent's commentary on the *Periplus*, seems to have overlooked the two former places. If tin was imported into Arabia from Egypt, it will justify the doubt of its being abundantly produced in Malacca at that day, and we may be confident that further west such supply was impracticable. The result of these observations is that China and India in ancient times (with, in later times, the Asiatic peoples who depended on the Arabs for their trade), probably derived their tin from the Malay peninsula. For the sources on which Assyria and Egypt, Greece and Rome, were dependent we must go further.

This will be the proper place to notice that Strabo mentions the country of the Drangæ, a people of Ariana, as producing tin; this statement has not been confirmed. Sullivan and Sestini, who describe copper, iron, gold, and silver, as found in the mountains of Armenia, do not name tin. The country of the Drangæ was probably on the caravan route to China, and the arrival by this route of some Chinese metals possibly gave rise to the report, but the question is of remote interest.

Buckle has taught us that the growth of civilisation is no hap and chance affair, that nations do not readily plant colonies, nor do those colonies thrive in remote and out of the way districts unless there are peculiar advantages in the situation. A rich mineral undersurface, or a focus of trade, will be found to explain every example of such prosperity. This being so, we may ask what was the especial cause of the power and wealth of the Etruscans, situated in a rugged country and extending up into the roots of the Alps? Their local mineral wealth was insignificant compared with Spain, and the competition with it would have been ruinous with such a resource only. Was their country then the focus of a trade unrecognised in later history and overlooked by modern inquirers. Such an explanation is not improbable. The source of amber was a mystery to the earlier Greeks, it would hardly have been so if it had been supplied from Sicily as some will have it. Hesiod and Herodotus connect it with the Eridanus; the German critics make this to mean a small tributary of the Elbe, or the Vistula; as likely to have reached the knowledge of those old writers, as the existence of America. Much more probable, surely, is it that by the Eridanus was meant the then western limit of geographical knowledge the Italian Eridanus, the Po, then in the possession of the Etruscans. We know that in Roman times amber was derived, as it is now, from the shores of the Baltic, and Pliny quotes the account of Pytheas of the islands where it was found. In the middle ages

there were several trading routes from the Baltic right through Germany to the Mediterranean, and there is very great probability that they were of the remotest antiquity. An embassy from the Æsti, who visited Theodore and brought with them a present of amber in the sixth century, no doubt went by one of these routes. At an early date a Roman agent is described as making the journey from Carnuntum, a frontier town of Pannonia, and returning again bringing with him a lump of amber weighing thirteen pounds. This, too, at a time when Germany was in a very different condition to what it was 400 B.C. Sir G. C. Lewis supposes that amber reached the markets of the old world through the Adriatic Veneti. Theophrastus connects it with Liguria, conterminous districts on either hand to the Etruscans. Now the Etruscans were, as all know, the chief amber workers of antiquity. Their tombs are rich in amber relics and every Etruscan collection is the same. Far up into Rhætia their colonies extended, and their situation meets all the requirements necessary to the importers of the precious mineral, and I am convinced that they were the real amber merchants of antiquity. If this be so, and we can postulate the extension of Etruscan influence to the Prussic shore of the Baltic, we may well believe that the Germany of Tacitus, which it is so hard to reconcile with the relics found in the ground, was not the Germany of an earlier day. But what has this to do with bronze? Why this: that the Etruscans were among other things the most skilful of the ancient workers in that metal, and they were not likely to have overlooked the materials for making the alloy if they were accessible in their neighbourhood. And what is the fact? Bohemia and Saxony abound in rich deposits of tin, which may be found described by Born in his travels through the Banat of Temeswar. These deposits have long been worked. Matthew Paris is quoted by Camden and Bechmann, as stating that a Cornishman who had fled for murder first discovered them, and caused the revenue of Richard, duke of Cornwall, to suffer in consequence. Paris died in 1259. Albertus Magnus, who died in 1280, says that tin was then dug up in many parts of Germany. Gmelin relates that the mines in the neighbourhood of Grauppen were discovered as early as 1146. These authorities shew at least that tin was worked here as early as the twelfth and thirteenth centuries. What happened in this part of Europe between the fall of Rome and the above date I do not know, nor do I know if the Romans worked *tin* here; but I fancy their hold on the country was hardly sufficiently secure till the time of Trajan, when we find Zalatha the seat of the upper court of mines, which is attested by many inscriptions containing references to the

Procuratores Aurariarum Daciæ and the Collegia Aurariarum. I am not sure that tin was among the metals here sought by them, nor do I know much of Roman economy at and after this period, but I can hardly suppose that the owners of Cornwall and Spain would have ignored these deposits. At an earlier day Tacitus tells us the Germans worked no mines, but the Germans were barbarous intruders into this area: the Boii, whom they displaced, and who were intimately related to the Helvetii, were, we may well believe, a more polished race; but at the date to which I am coming I doubt there being any Boii at all here (the reasons for this doubt may appear in a future paper), and I am satisfied that the conclusions of archæologists must be sustained, and that a people of very high relative culture then inhabited Central Europe. At this date we have some evidence that mines were worked in South Germany, though it is still fragmentary. In 1865, M. Raumsauer, the director of the salt mines of Hallstadt, communicated to the French Academy a paper on some discoveries made by him at Rudolfsthurm, a castle in a valley filled with excavations, in which he opened nine hundred and sixty-three tombs of the bronze age, containing an extremely rich assortment of bronze relics, amber collars, and glass beads and vases, and in the mines themselves and among the old galleries ancient tools and bronze picks, a fibula, woollen stuff, and chamois leather. I have only met with a very meagre account of this discovery, and further evidence would be very desirable. Among the ancients, testimony to this mining is hardly to be expected, as the district was beyond the reach of those who have left us any accounts of such subjects; but I may say that Scymnus names two islands at the head of the Istrian Gulf as producing tin, and, if there was any foundation for the report, it must have been that a trade then existed in tin with Germany. We are told that in the earliest times the Ligurians abounded in brass, and we can well imagine an exchange of bronze or tin for the amber of the Baltic existing to the north of the Alps. That bronze was cast in Denmark itself (which would hardly have been the case if the tin had to come from Britain), we know from the number of moulds still found there.

Sweden contains deposits of tin which may have been worked in ancient times. The Finnish women use tin thread and spangles to embroider their clothes with, and have done so apparently from an early date. The Finns are good metallurgists, and forge iron in their little furnace; but the scarcity of bronze weapons in Sweden, like the similar scarcity in Russia, seems to shew that in ancient times the mines of the former country and the Ural Mountains were unworked.

I am not prepared to say whether tin was anciently worked in Northern Africa or not. Deposits of it are found on the banks of the Mina, or Minah, and have been known since 1640. The district was so well settled by the same race who colonised Spain that it is not likely they would escape observation. The Atlas is, however, at present practically a *terra incognita*; not so the land across the Straits, the Mexico and Peru of the ancients, whence the Phœnicians, Carthaginians, and Romans, as is well known, drew their chief supplies of gold, silver, iron, and lead. I purpose shewing that to this list must be added tin.

Tarshish, the best opinions now agree, was at first a correlative term with the west. Thence the eastern markets were supplied by the Phœnicians with many luxuries, among them with the bedil stone, the cassiteros of the Greeks. This is confirmed by the legends which tell us that Midacritus or Melcarthus, the Tyrian Hercules, was the first who introduced it. Gradually, as the west became better known, the term Tarshish became more fixed and limited in its meaning, and no doubt eventually it is to be identified with Tartessus, the Mart at the Pillars of Hercules.

The Greek knowledge of the west in early times was entirely derived from foreigners. Colæus Rhodæus, about 400 B.C., is said to have been the first who visited Tartessus. The outer ocean was guarded jealously, and the best authorities seem to be now agreed that even Pytheas of Marseilles was but a retailer of the second-hand stories current at Gades. What is told us, therefore, of the west by the earlier Greeks, and this includes Herodotus, who speaks on the subject with characteristic caution, must be received *cum grano*. It was the Tyrian merchants, who sold toys to the heroines of Homer and carried the world's gossip to Thebes and Babylon, who monopolised the secret; the busy market loving first-cousins of the Jews, who, no doubt, flocked to their maritime cities and colonies, the bullion dealers and pedlars of all time. That Tarshish was the western market for tin in the earliest times has been generally admitted; how it came there, and whence, have been subjects of much controversy. Fleets of penteconters labouring with equal skill and pertinacity from Gibraltar to Falmouth have received considerable attention from antiquaries, and have not been extinguished by the cruel criticism of Sir G. C. Lewis. I shall not quote from his analysis of its ridiculousness, nor insist on the small probability of anything save an occasional coasting craft venturing on such a voyage. We know that in Roman times the chief track was from the south coast of England to the ports of the Veneti, and a dim tradition speaks to us of a

route in earlier days from the lighthouse at Coruna to the tower at Belerium. Granting that the sea voyage is impracticable, the tin must have come to Tartessus, one of the Tyrian or Sidonian ports on the Andalusian coast overland, and we are told that it was brought down the river Batis.

On examining the condition of the interior of Spain then, we find it very different from the normal Spanish type; apparently very thickly peopled, apparently studded with colonies, and traversed with roads, not the Spain of to-day with its more than half-savage wildernesses. In every corner where a trace of metal is found, from the mountains of Granada to the obscure corners of Traz os Montes, Algarve, and Biscay, heaps of scorïæ, unchronicled antiquities, and labyrinths of ancient workings, exist. I would refer all who would deem me exaggerating to the pages of the *Revista Minera*. Spain was then, in fact, the great smelting house of the world:

To discriminate the relative ages of the different ancient workings is a task of no easy nature; I doubt, indeed, whether it be possible to do so accurately with our present materials; rudeness is but a poor test of antiquity, and, where a monotonous sameness prevails in the type of working, it is hard to frame a chronology from the progressive character of the works. Most of the Spanish mines seem to have been worked by the Romans; but many of them, especially in Biscay, contain remains which are at least conventionally of the higher date when stone hammers and wedges of stag's horn and wooden picks and shovels were the ordinary mining tools. In the Asturian mines articles are said to have been found with Phœnician inscriptions upon them. The dearth of antiquarian interest and testimony among modern Spaniards makes the slightest evidence of perhaps greater value. If the collections which are said to exist at Madrid were published, there are not a few riddles in ethnology which would be resolved; until then our statements have little more authority than guesses.

Tin is found in two species of deposit: in veins and lodes; and in small lumps and pebbles, mixed with gravel, and known as stream tin. In the East Indies, the latter deposits alone have been worked; in Europe, from very early times, both species have been mined (Pliny and Strabo). Stream tin is nearly always associated with gold, and it may have been in searching for the latter that the former was first noticed. However this may be, there can be little doubt that, in ancient times, gold washing and tin washing were carried on in the same places simultaneously, and ancient authors tell us this was the case in Spain. Pliny, speaking of tin in Gallicia, says:—"It is also found in the gold mines known as Alutiæ, the stream of

water which is passed through them detaching certain black pebbles mottled with small white spots, and of the same weight as gold ; hence it is that they remain with the gold in the baskets in which it is collected, and, being separated in the furnace, are then melted and become converted into tin" (Pliny, book xxxiv, ch. 47, Bohn's translation). The vast excavations which remain in the north of the Peninsula are often associated with the mining of gold by the natives ; their true character has been ascertained by Schulz, the director of the Spanish school of mines, and others.

I will now quote some descriptions of these excavations.

Murphy, in his *Travels*, speaking of Northern Portugal, says :—"Mines of fine tin may be seen in Amaranté, Bonzella, St. Pedro do Sul, Belmonte, Bragança, and Vizeu ; there is also one in the district of Monforte, of which Pliny makes mention (?). . . . The mines of the provinces of Nimho and Traz os Montes are certainly the most stupendous works of the ancients existing in Portugal ; were proper surveys made of them they might throw some light on the manner of forming mines and conveying minerals through subterranean passages. . . . In the province of Traz os Montes, in the district of Alfarella, is a place called S. Miguel das tres Minhas, wherein are seen three immense mines generally supposed to have been worked by the Romans. The mouth of the largest, which has been cut through the rock, is a mile and a half in circumference, and upwards of five hundred feet deep ; at the bottom it measures two thousand four hundred by one thousand four hundred feet. . . . A road is hewn through the rock at the height of seventy feet, large enough to admit a cart. In the adjoining valleys are seen heaps of rubbish which it is natural to suppose had been dug out of the mine. The mountain is a labyrinth of passages." These Murphy describes. Again, "near the village of Seixo, in a place called Val de Covas, are seen three caverns, each twenty feet high, their length and breadth (and I may say age) may be inferred from their containing olive plantations. The inhabitants generally suppose them to have been gold and silver mines opened by the Romans, and they pretend to shew the vestiges of a canal by which the ore was conducted to the river Orseira, three miles distant."

When in Portugal in 1857, I heard in Lisbon that among the hills of Braganza, and while exploring for tin, the workmen had come across some old workings in which were found many ancient tools, including wooden spades, such as are well known to Cornish antiquaries.

In the *Descripcion Geognostica de Galicia*, Don Guillermo Schulz, the Director of the Spanish School of Mines, says :—

"In the primary strata of Gallicia we have not discovered any precious metals except tin, of which it appears we have abundance in many places." Among others he mentions Vilar de Ciervos, a league and a-half south-east of Monterey; Arincelos dos Leguas, to the north of the same place; the mountains of Penanta and Ramilo, two leagues to the east of Viana, in the jurisdiction of Montes, in the province of Ponte Verda; at Couson de Avion; at Mount Balsidron, south-east of Rivadavia, and at Porto Mouro, on the right bank of the Sambre; and among them several ancient mines which existed from time immemorial, as those of Tajeiros Vellos, in the parish of Azumara, four leagues north-east of Lugo.

From the *Geological Description of the Asturias* by the same author, published in 1858, I take the following. "To the east of the church of Salabe, on the coast, two leagues east-north-east of Rivadeo, there is in the primitive rock an ancient exploration of tin of enormous dimensions chiefly open to the sky, and pierced with subterranean galleries for drainage." . . . Again, "Useful and precious minerals no longer abound in the western part of the Asturias, as they were worked with incredible zeal in remote antiquity, and as is shown by the grand and numerous ancient works," on which M. Paillette has published a very interesting memoir in the ninth volume, second series, of the *Geological Bulletin of France*. "The before-mentioned immense working at Salabe has an outlet for water, two leagues and a-half in length, and numerous galleries emptying into the sea. Their bottom was occupied up to 1830 by several lagunes; when these were drained, there appeared repeated and considerable layers of charcoal intercalated with layers of clay, curious examples of smelting, really historical, which also occur in other ancient mines in the Asturias," (and, I may remark, in Malacca, where almost identical structures are described by Newbold as now used by the Chinese smelters.) "One of these lagunes was of great depth and difficult to drain, and we are of opinion that this, from special peculiarities, was of the age of the Phœnicians, and had for its object the extraction of tin. The ancient mines are distinguished by their ingenious drains to convey the running water to the highest points of the mines. They are looked upon with veneration by the inhabitants of these mountains, who style their makers simply the ancients." He refers at some length to similar mines at Monte Furada and Villa de Salas, and mentions the recent rediscovery of tin lodes close to the ancient workings at the latter place.

I might go on to quote largely from the paper before-mentioned (and of which a translation may be found in the *Revista*

Minera) on the distribution of these immense workings, but will content myself with one interesting passage. "Among all the hilly districts of Lusitania are found many tin mines. In all the editions of *Agricola* is found a description of a small grinding mill, with cylindrical blades, which serves the Lusitanians for breaking the ore. These same mills still exist in that part of the province of Zamora bordering on Portugal, in places comprehended in the ancient Lusitania. The contrivances are traditionally very ancient." He then goes on to describe their structure. They are, in fact, the Egyptian screws mentioned as used in mining among the Celtiberians by *Diodorus*. These extracts will suffice to shew the greatness of the tin deposits of Spain, and also the extent to which they were used by the ancients. Granting that they are correct, is it probable that the ancient miners would in the earliest times go beyond the sea for their chief supply? Assuredly not. We have shewn from their ruins how much these mines were worked, but our evidence is not exhausted. *Posidonius* speaks of tin as worked by the barbarians beyond Lusitania. *Avienus*, in the *Ora Maritima*, describing certain places on the western coast of Spain, mentions Mount *Cæsius*, and makes it the origin of the Greek term *Cassiteros*. *Eustathius*, *Scymnus*, and *Stephanus* of *Byzantium*, refer to the *Bætis* as the river down which tin was carried to *Tartessus*; *Strabo* speaks of Spain and Lusitania as sources of tin, and *Pliny*, who was a procurator in the former country, and therefore likely to know, says, speaking of tin:—"It was called by the Greeks *cassiteros*, and there is a fabulous story of their going in quest of it to the islands of the Atlantic, and of its being brought in barks made of osiers covered with hides. It is now known that it is a production of Lusitania and *Gallicia*." This passage may be a slight exaggeration. It has been very conveniently ignored by patriotic Cornishmen; and is, I may claim, even granting that it may be exaggerated, strong evidence in favour of my position, which is, that in early times Spain was the main source for tin.

It is not to be doubted, and in fact we have ample evidence, that the hardy race of Iberians who peopled the Peninsula had in very early times crossed or extended beyond the Pyrenees, and beyond the limits of Aquitania right up to *Finisterre*, and that they probably discovered and worked the tin mines of Brittany, which, though not very extensive, are productive and have a high antiquity; nor that, content with the mainland, they should not have ventured out towards the islands in the north, and have settled there in considerable numbers; nor that their Tyrian masters, or at least their civilisation, may not have followed after them; nor, lastly, that the tin mines there should

have been unoccupied, while the local wants were supplied from the distant resources in the south. All this is probable and more. It is not to be doubted that a kindred race, employed in a kindred industry, should have kept up a perennial intercourse with its mother country. In a paper I had the honour of reading at the British Association, I brought together many proofs of the large infusion of Iberic that there is in some Celtic languages, and other evidences are accumulating to shew that, in early times, Britain was ethnologically a mere outlier of Spain, and indeed, it is no new discovery. Dionysius Alexandrinus expressly says that the Hesperides, where tin was obtained, were inhabited by Iberians. Strabo describes the costume and customs of the inhabitants of the Cassiterides as identical with those of the Iberians; Tacitus refers the black haired Silures to a Spanish origin; we all know the place that the Spanish Milesians fill in Irish legends, and how the Welsh connect their kindred the Lloegrians with the Loire. In order to understand the prominence which the British tin mines have acquired, we must digress a little.

The gradual extinction of the importance of the mother cities on the Syrian coast, and of their immediate colonies, is an obscure question. The Assyrians sapped their strength, and as it faded away, so grew the power and wealth of Carthage and its colonies. Medina, Sidonia, and Tarshish, gave way to Carthage, Gadir, Saguntum, and other cities. Carthage thus became the real master of Spain, getting thence food and metals, and recruits for its armies. The change of masters was, no doubt, slighter in kind than in degree; such change, however, does not seem capable of discrimination now. Up to about 450 B.C., the Mediterranean west of Sicily was practically unknown save to the selfish monopolists of the Cyrenaica. About this date, apparently, the Greeks began to contest this monopoly in Sicily and elsewhere, and their colonies invaded the sea-board of the west. They followed fast on a wave of a kindred race which was advancing overland. Wherever this race reached a coast, there were Greek colonies planted; this race was the Celtic, and thus the Phoceans came to found Marseilles among the Ligurians, as far as we know, a mongrel race of Iberians and Celts, and the frontagers of both peoples. The founding of Marseilles would affect the prosperity of Gades in a manner hardly sufficiently recognised; to it the trade of Gaul would be diverted, and more than this, the Celts who were advancing in that country, were advancing in Britain also, and soon *its* attraction would be to the Gallic rather than the Spanish main, and such attraction would carry with it trade and commerce, and thus a spur

of competition be given to the mines there ; and thus the navigation between the southern coast of England and the ports of the Veneti, which was so prosperous in later days, would commence. And to this period we may assign the beginning of that overland traffic in tin of which Diodorus has left us an account dear to Cornishmen. Carthage might still supply the east, the Etruscans still supply their own wants and those of Italy, but the Greek Islands would receive theirs from the traders of Marseilles, who would report the rich islands of the west, and from their reports geographers and historians learnt the facts which they relate to us.

Presently both Carthaginians and Greeks were ousted by the Romans, whose advent as the masters of the world and the very type of colonisers, no doubt gave a great impetus to mining operations. Roman roads, Roman coins, inscriptions, and monuments, saturate the peninsula, especially the mining districts. Masters of both Spain and Britain, these two countries would resume their relative importance as sources of tin ; the latter probably supplying little more than a local demand. This we may gather from the statement of Pliny already quoted. Marseilles would seem, however, to have become the focus of trade for both countries, and we know that tin came to be looked upon as a Celtic commodity, and that among the Gauls the Bituriges and the inhabitants of Alesia were especially celebrated as tin platers. The vessels described by the ancients as thus plated were probably the lineal ancestors of a similar ware still used by the Portuguese and Spaniards to import distilled water from Malta, and called *stagnone*.

Having shewn how Britain became notorious as the source of tin, I pass to the consideration of its deposits. The Scilly Isles, as the traditional *Cassiterides*, have puzzled inquirers from the absence of any but the slightest traces of tin or of its mines there. The deposits may have been exhausted, or the real tin islands may now be submerged, or they may really have been a conventional name for the mainland of Cornwall and Devon, or they may have been a conventional name for some source in Ireland. It is strange that, when spoken of with any precision by the ancients, they are generally placed off the coast of the *Artabri*. If by *Cassiterides* was meant anything more than the rocky islets on the Spanish coast, this description applies best to Ireland. But I believe no deposits of tin are known on the south or south-west coast of that island opposite to Spain ; but they are known in another neighbourhood, namely in the mountains of Wicklow, and their produce may have been exported from some port on the south coast. This is a conjecture merely ; the mines of Wicklow are stream

washings, and are similar to those of Spain in containing a mixture of gold and tin stones, and I have little doubt that much of the gold fashioned into ornaments which are so commonly found in Ireland was derived hence. I have no less doubt that from here was also obtained the tin needed to supply the great demand of the workers of the so-called bronze age in that island, so prolific in remains of this alloy. These mines of Wicklow are not very productive now, though it is, perhaps, more from being neglected than from their poverty, since Mr. Mallet, who is cited by Mr. W. Smyth, has found ore containing three-and-half pounds of tin to one hundred and fifty pounds of sand, being a greater proportion than is known anywhere else. There are very ancient workings, and they are described as precisely similar to those found in Spain, but they seem to have been almost neglected by archæologists.

In Cornwall, at many places described by Polwhele and others, there are many traces of ancient mines, among which have been discovered numbers of Roman coins and tools, but little of earlier date; the only exceptions being, perhaps, a bronze figure of Apis, described by Mr. Birch in the *Archæological Journal*, and some stone mauls and other primitive tools. The works are not connected, however, with Rome in the local traditions. In the quaint words of Carew, "They maintaine these works to have been very auncient, and first wrought by the Jews with pickaxes of holme, box, and hartshorne. They prove this by the name of those places yet enduring, to wit, Attall Sarazin, in English the Jewes offcast, and by those tools daily found among the rubble of such workes; and it may well be that as akornes made good bread before Ceres taught the use of corne, and sharpe stones served the Indians for knives untill the Spanish brought them iron, so in the infancie of knowledge these poor instruments, for want of better, did supply a turne. There are also taken up in such works certain little tooles heads of brass, which some terme thunderaxes, but they make small shew of any profitable use. Neither were the Romans ignorant of this trade, as may appear by a brass coin of Domitian's found in one of these works, and fallen into my hands; and perhaps under one of those Flavians the Jewish workmen made here their first arrivall."

Mr. Tonkin remarks on this, (quoted in Polwhele): "These old works are also called by their more ancient name Wheal an Iethewon, the works of the Jews, whose aqueducts, levels, etc., are to be seen all over those parts of the country where tin is found, particularly in Piran Sands and St. Agnes."

The amorphous lumps of tin occasionally found in the workings, and of which the Jermyn Street museum contains two specimens, are in popular imagination relics of the same race.

Whether the Jews really worked these mines in Roman times, and whether their connection with Cornwall was handed down from their kinsmen the Phœnicians, is an inquiry of interest, but at present apparently unapproachable. It is clear that in the middle ages the Jews had almost exclusive possession of the mines, and a monopoly of the trade in their produce. That this must have been great after the Moorish and Gothic wars in Spain had closed the mines there, which we know that they did, we may gather from the revenues of the earlier Earls of Cornwall.

The ancients also worked many mines in Wales and Anglesea, chiefly copper and silver; and articles of stone and stags' horn, often associated with ante-Roman times, are not infrequently found. The silver mines of Cardigan, I would suggest, gave their name to the Silures, Sillera in Basque, *i.e.* Iberic, being the well known name for silver, and probably the origin of our own word.

These facts are all eloquent of an earlier race than the rude tribes described by Cæsar, a race which probably left to the South Britons that legacy of a superior culture which he assigns to their proximity to Gaul, a race of smelters and miners who occupied the west until an invasion of barbarians similar in type and in the results of their handiwork to those who, in the fifth century, overthrew the Roman empire, but who arrived eight or nine hundred years earlier; a race who have marked an archæologic era—the bronze age.

I have now exhausted the possible sources of tin; and the result of a tedious marshalling of evidence, leaving out secondary and unimportant supplies, is, that Britain in early times furnished a very limited demand for tin; that Spain was then the grand source of the metal; that the Etruscans and the nations north of the Alps were supplied by the mines of Bohemia and Saxony, and that the mines of Malacca were practically unworked by the ancients. This conclusion is purely tentative; but, in being so, it shares the fate of every archæological and historical conclusion, and I venture to hope it is supported by the greatest probability.

Advancing from this conclusion, we may be assured that, when the corroded bronzes which are found in the earlier tombs of Egypt, Assyria, and Etruria, were placed there, the northern rampart of Spain was well known to, and the intervening seas traversed by, races of men hardly to be recognised in the painted imbeciles stereotyped in popular history as our ancestors.

Tin in its separate state is too soft to be of much use in the arts; and beyond a few doubtful relics, such as the tin cups

figured in the *Philosophical Transactions*, vol. li, we know it (as used by the ancients) only combined with copper in the form of bronze. Bronze is of too complex a metallurgy to have been with any probability a separate discovery of isolated peoples. Its knowledge involves a wider experience than the mere light of nature would afford; and, judging from modern analogy, which is safer, at least, than *à priori* guessing, it was probably disseminated from some centre of civilisation. What this centre was is our next inquiry, and our evidence is of two kinds. First, that of etymology; next, that derived from a comparison of the forms and ornamentation of bronze objects: evidence which seems to me to give a very plausible answer, namely, that the Phœnicians were, if not the discoverers, the chief artificers and dispensers of bronze. To propose the Phœnicians as the solution of an archæological riddle, when the pretensions of over-patriotic Irishmen and the descendants of "Ancient Britons" have made the very name ridiculous, is perhaps somewhat presumptuous. Yet, before the world entirely obliterates them, and comes to view them as the archæological "Children of the Mist", it will be well to recall how great a space they filled in the history of the Old World, and, while eschewing any genealogical vagaries as to connections of race, to examine the probabilities of a connection of our earlier civilisation with theirs.

Pliny always refers to tin under the name of *plumbum album*. *Stannum*, which became its name in later times, when the knowledge of its metallurgy was more advanced, is used by him, together with *galena* and *argentum*, as the name of certain products of lead refining. All three terms were apparently imported, and have no special meaning in Latin. *Tinn* in High German, *tenn* in Swedish, *tin* in English, *étain* in French, *stean* and *staoine* in the Celtic dialects, *estagne* in Italian, and *estaño* in Spanish and Portuguese, are all forms of the same word *stannum*; and the two latter, containing the affix *e*, connect the whole with the Basque term *estanua*.

Galena is perhaps derivable from the old Basque root *gal* or *galea*, which means to lose or dissipate, and may be compared with similar names given by the German miners to the minerals cobalt and nickel; and *argentum* from *argina*, *argi* meaning bright, and having the same signification as *cillara*, which I conceive to be the etymology of the English word silver. The Basques, it is superfluous to state, are the remnants of the ancient Iberians, who peopled Spain, as far as we know, in the earliest times, and more, who by Wm. von Humboldt were proved to have formed the substratum of the population of Western Europe generally.

The Greek name for tin, *kassiteros*, and the Sanskrit *kastira*, are both derived by Bochart from the Arabic *kasdir* and the Aramaic *kastira*, which are said to be connected with the root *kash*, to sparkle. The Talmudists translate the word *kasterion*. These Semitic equivalents of the word land us at the Phœnicians, who no one now doubts spoke a language but slightly differing dialectically from Hebrew, and consequently distinctly Semitic. In Persian the names for tin are *kalai*, *resas*, and *arziz*, which are said to be all Arabic; perhaps *kalai* is Turkish. The Indian and Sanskrit name for tin is *tirane*, which is derived from *tir* (meaning the extremity of the world) by an able writer in the second volume of the *Asiatic Transactions*. The Malayan names for the substance, Mr. Crawford tells us, are imported from Sanskrit, and consequently from the West. The English word brass, Anglo-Saxon *braes*, Gaelic *prais*, is connected with the German *brasen*, to burn, Icelandic *brasa*, to solder, Spanish *brasa*, embers, whence *brasero*, which are most probably again derivable from the Basque *brasa*, *braserua*, *brasoncia*. I have not much hesitation in making the Basque *broncea* the common ancestor of the English and French bronze, Italian *bronzo*, Spanish *bronce*. These etymologies, limited as they are, point to the Phœnicians and their peculiar clients or dependants the Iberians, on whose every shore they were to be found, as the probable disseminators of tin and bronze. A confirmation of this position is derivable from a criticism of the ornaments and forms of bronze objects.

One fact which has puzzled antiquaries not a little, is the *apparent* annihilation of nearly every relic of distinctly Phœnician workmanship. If this people were what tradition says they were, where are their remains? we are constantly asked; we have their alphabet, and a small vocabulary in a few inscriptions, a few coins, and what else? In Babylon and Assyria, in Greece, Asia Minor, and Italy, we are at no such loss for evidence of ancient greatness; but where are we to look for Phœnician types? I say everywhere. Tradition and the firmer records of history speak of the Phœnicians as brass workers and merchants, not only at Tyre, but at Jerusalem, at Nineveh, in Greece, and in Northern Africa. If we find a common type in use in all these countries, we may assuredly assign it to the only race we know who were cosmopolitan enough to have introduced it—to the neglected Tyrians and Sidonians. Along the shores of the Mediterranean, the earlier relics, which betray a certain rude, uncouth, artistic feeling, are thrown together into a huge bag of mystery, and labelled archaic. These, it has not been disputed, maintain a family likeness in Italy, the Greek main and islands, and Asia Minor. Archaic! mysterious word, how

would Phœnician sound ! We all know the riddle, though few appreciate the answer, of the travels of Hercules in the West, the hero whom the Greeks avowedly borrowed from the Syrian coast, where he was known as Melcart : the Greek lore about Cadmus and others : the Etruscan and Roman traditions about their ancestry in Lydia and the Troad. But these are only traditions, and the times are not prone to believe in such evidence, though why the times should arrogate peculiar shrewdness therefore it is difficult to say. It will not, perhaps, cavil at the evidence of the monuments. Ante-Roman art in Europe seems distinguishable into two well marked eras—an early, and a developed form. The latter, influenced no doubt by Egyptian models, received and possessed a distinctly peculiar local colour from every distinct race among which it grew. Its beginning may, perhaps, with considerable probability, be fixed to the period when the Greeks emancipated themselves from Eastern control by the Persian wars. Art and literature then sprang into a new and advanced position ; and the wave, flowing through the colonies of Magna Græcia into Etruria, inaugurated there doubtless the era of those art-bronzes and other works, and especially the fictile ware, which show so great a common feeling with those of Greece, and whose mythological ornamentation may be said to be identical ; which era has generally, however, been dated too high, and which certainly extended into somewhat late Roman times. This emancipation of Greek and its dependent art from the rigidity and conventionality of its early forms, about the time of Pericles, has a very close parallel, and one pointing to similar causes, in the revival of art in Italy in the fourteenth century. The archaic forms that preceded the one, and the Byzantine stiffness that preceded the other, being singularly correlative. The effect of the revival in Italy on the art of Spain and France and Flanders, countries which had commercial relations with it, are no less illustrative of the similar influence which a rigid induction would establish between Greece and Asia Minor and Etruria. With this advanced art, which arose after the decline of Tyre, I have nothing to do. It is with the archaic alone that I would deal. Like that of Byzantium, it would appear to have been the degraded descendant of a better type, and, like it, to have consisted in monotonous repetitions of rude models, rather than in imitations from nature, or in original inventions. Its crudity is most apparent in its treatment of human and animal forms.

If we take the earliest specimens of Greek art that we know, such as the Lycian sculptures discovered by Sir C. Fellows, or the remains found in Rhodes and elsewhere, and compare them with Assyrian examples, the resemblance will be found very

striking. The earlier Greek armour and the latest Assyrian (especially in respect of shields and helmets) are almost identical. The griffons, and lions, and mythologic monstrosities, so characteristic of the one, will also be found amongst the others; the type of face, even, is strikingly similar; and, if we go beyond Greece to Etruria, we shall find the resemblance still more marked. The bronze bowls with their embossed friezes, the amber work and ivories, in form and subjects (here and there shewing traces perhaps of an Egyptian influence) are in the main almost stereotyped copies of what are found in Mesopotamia. If we cross the Alps into Germany and Gaul and Britain, our evidence is no less marked. A great authority has objected to me, that these embossed figures, so common on, and characteristic of, Eastern and Etruscan objects, are wholly wanting north of the Alps. I would answer this objection by saying, that such ornamentation is confined to a certain class of objects only in the former districts, and such objects are absent (I was about to say necessarily) from the latter. The arms, the collars, the beads and personal ornaments, are not so decorated. It is only the pateræ and bowls, *objets de luxe* hardly likely to have been exported to, or appreciated by, the peoples of the North. When the backwoods of America were supplied with axes from Birmingham; when the traders of the Slave Coast introduced coloured beads, which must now be scattered over Central Africa; when the eastern merchants imported into Scandinavia the hoards of Cufic coins now found there; we do not find them supplying vases of Sevres, or Italian bronzes, or damascened bowls to the same countries. It is only the luxuries and ornaments which are likely to be appreciated by a people of inferior culture, and the weapons and tools that are absolutely needful for their warfare with their neighbours and with nature, that become the objects of commerce with them, and whose manufacture is eventually introduced. The connection between Etruscan and South German and Swiss bronzes, has not escaped (nor could it well) the notice of northern archæologists. The armlets, the gold trinkets and fibulæ, the celts, palstaves, and swords, are almost identical; and in their minute ornaments in the zigzags, the concentric circles, the double spirals, etc. (which distinguish the pottery of the same period no less than the bronzes), are in Germany and Britain very close copies of the similar ornaments on Etruscan mirrors and brooches, on early Greek marbles, and on Assyrian remains. The daggers and leaf-shaped swords, which are everywhere of so constant a shape, and which may be found figured on the vases and coins and marbles of the south and east, also betray an unmistakable common origin.

In vol. xxxvi of the *Archæologia*, may be found a most interesting paper by Mr. Kemble, on a number of bronze remains found in a tumulus at Schwerin, among them a model of a waggon with strange figures upon it. Similar ones have since been discovered in Styria and in Northern Italy. These are undoubtedly Etruscan; and Mr. Kemble, who fancies them to be the remains of a Gallic people who lived on both sides of the Alps, confesses that he is obliged to assign them to the handiwork of the Tuscans. Similar grotesques are commonly found in Sardinia, and many are figured in De la Marmiora's work on that island, and they are not unknown in Ireland. Bronze helmets of a conical shape, like those used by the Assyrians, have also been found in Germany, and I have little doubt that many unexplained and mysterious bronze articles found in Ireland, need but careful comparison with those in the museums of Tuscany, to respond in no hesitating manner to the question of whence they came. In January 1849, a bronze celt, one out of eighteen or twenty found in a coal mine in Andalusia, was exhibited at the Archæological Institute by Mr. Pratt. In his remarks on it, he said ancient objects had been found in the mines of Asturias, bearing Phœnician characters similar to those found on the coins of Gades. They are now preserved at Madrid. Were these objects accessible, they would perhaps finally dispose of the whole controversy. As it is, circumstantial evidence is accumulating rapidly in support of my position, that the Phœnicians, who gave Italy and Greece their letters; who it appears more clearly every day were the channels by which the mythology of the Euphrates was transferred to the Ægean; to whom we can now trace so many myths, supposed formerly to have been Grecian home-spun; whose chief city was the Birmingham of the ancient world; were also the bronze merchants and manufacturers of antiquity. The focus of their influence was the Mediterranean, whence it spread into the remote corners of Ireland and Gothland, both then apparently homes of the ante-Celtic races.

From this point we obtain a clearer view, susceptible of a wide extension, of the mysterious civilisation that preceded the Greek and the Roman in Europe, whose vast extent has been strangely lost and overlooked beneath the grandeur and the ruins of its daughters. We begin to see that the fall of the great Semitic peoples was a catastrophe as full of meaning and as extensive as the similar fall of Rome; that the Greeks were, like the Goths of a later day, but a barbarous race of intruders into an area which had a history before their arrival. Formerly we were directed to the first Olympiad as the beginning of reasonable culture. We now

begin to see that it marked rather a parallel age to the seventh century after Christ, when the dark ages that succeeded on the destruction of a civilisation reaching from Scandinavia to the Persian Gulf, gave signs of revival. We are pushing aside the curtain drawn over the earlier time by the arrival of the Indo-Europeans; when the Semites were the world's leaders, with the great king, the King of Assyria, at their head; when Tyre and Sidon were the metropolis cities of culture and wealth, and Tarshish in the west a region of renown to the Jew and the Assyrian. Some of the questions raised by this earlier historic prospect, I hope to examine, with your permission, on another occasion.

Having discussed the sources of tin, and the questions arising out of the manufacture and dispersion of bronze, I proceed to the remaining question of its chronology.

Brass, which in the Bible means bronze and sometimes copper, is repeatedly mentioned in the Pentateuch. The institutes of Menu refer to vessels of copper, brass, pewter, tin, and lead. Egyptian bronzes are known of as early a date as the sixth dynasty, and Agatharcides mentions brass wedges as found in the old workings in the Egyptian gold mines. Bronzes were found in tolerable abundance among the excavations at Nimroud. Homer teems with references to the metal. Bronze articles have been found among the ruins of Mycenæ and in the tumuli of the Trojan plain. The earliest undoubted Roman relic we have is the bronze wolf of the Vatican. Chinese bronzes, of which some have been exhibited at the Archæological Institute, and a sword with an early inscription now placed in the British Museum, are found of high antiquity; and, lastly, a lump of bronze unshapen was discovered by Mr. Christie in one of the caverns at Perigord. These instances carry us back to the very threshold of the history of many ancient peoples, to a time when our knowledge of the origins of mankind becomes at all tangible, and we then find bronze known among them all. We have seen reason to suppose that it was discovered and introduced by the Phœnicians,—when is a question at present unanswerable, save, perhaps, to intuitive philosophers. It will suffice that its knowledge can be carried as far back as records of historical, as distinguished from geological, value take us. I now approach the question of a bronze age upon which so many great authorities are at issue.

The terms stone, bronze, and iron age have served a good turn in ethnology. They have served as useful points around which to group a confusion of facts. But their vagueness and indefiniteness has given cause to so much wild writing, that I think it is worth while considering whether their continued use is not a mistake.

In the first place they are confined to the periods supposed to be distinguished by the use of stone, bronze, and iron for cutting instruments ; that is to say, the ages ought to be styled those of stone, bronze, and iron weapons, rather than of stone, bronze, and iron. Again, one school of archæologists separate the early history of every distinct race into periods of progress, which they aver are generally marked by the successive use of stone, bronze, and iron for weapons. Another school argue that this successive use rather marks eras in the world's history than periods in that of every distinct people. Beyond an inviting *à priori* assumption that the universal law of history is the progressive advancement of mankind, I can find little support for either of these positions. Such a law is, perhaps, true in the main, but is falsified in particular cases by every step we take in ethnology. It is but a poor reason in these days of positivism, when *à priori* reasoning and the searching for the beginnings of things in inner consciousness, rather than in the laboratory of nature or the ruins of its history, is held to be poor philosophy in every science pretending to a fixed and sound character.

The South Sea Islanders and the South American Indians, who still use stone weapons, the Indians of the Copper-mine river and certain Siberian tribes, who use, or till very lately did use, copper weapons, the Esquimaux, the Andaman Islanders, and the Negroes of Central Africa, who use iron implements, it would be difficult to class in order of culture according to such a rule. If we go to ancient authorities, and examine the armature of the levies in the army of Xerxes as given in *Herodotus*, we shall find an equally difficult task, every kind of offensive weapon from steel to burnt wood, with all the intermediate varieties of bone, horn, and stones, being used and described.

I object entirely to start with the assumption, for which I do not know of a tittle of real evidence, that the civilisation of the man who uses flint flakes is the *natural* ancestor of that of the man who uses a Sheffield razor. The abject humanity that crouches round the pyramids, that lives under the shadow of the Parthenon, that looks wonderingly at the huge monuments of Ceylon and Java, is a protest against such a generalisation. Altered conditions of livelihood have converted the Hottentot into the Bosjesman, and the Indian of the plains into the digger Indian, have converted the undoubted flesh and blood of the Anglo-Saxon into the very questionable compound who is the pioneer of civilisation in Texas, I mean the Indian trapper ; and it only requires an aggravation of the circumstances to make the Sheffield whittle grandfather to the obsidian knife.

The possibility, I say, is unquestionable. I have tried to

shew that in the earliest ages to which we can carry any sound criticism, the manufacture and trade in bronze in the east were the monopoly of the Phœnicians, who had to carry it a long way; and, no doubt, to charge very dearly for it. The area of demand for dear luxuries was then probably confined to the valleys of the Nile and the Euphrates, and the countries bordering the Eastern Mediterranean. As we recede from this focus, barbarism would assuredly increase, deducing our conclusion from modern example. Forests then covered large areas which are now cleared, cultivation was apparently confined to the deep soils on the banks of a few rivers and lakes, and men were forced from the nature of things to be nomades and hunters rather than settled husbandmen. Whatever we find to be the condition of such a class now, when the whole course of human culture has increased, and, above all, intercourse between remote countries has become the rule instead of the very exceptional example, that, exaggerated a thousand-fold, we may expect to find in old days. The Londoner and the Canadian voyageur of to-day, the courtier of Elizabeth and the Irishman without the pale, the knight of Edward I and the follower of some northern chieftain, are modern examples of the effects of retrogression from a centre of cultivation.

Bronze would be cheap comparatively at Babylon, Nineveh, Tyre, and Sidon (abounding in brass, as she is called), and might, and did, as we know, form the armour of the Canaanites and some of the Assyrians. But we can well believe that it must have been a very expensive luxury in the Getan waste and the German forest, and its use confined to a few rich individuals alone there; the common folk must have employed the boulders out of the river for their hammers, experts would imitate out of the harder stones, such as flint, etc., the occasional bronze models they saw, and the bones and horns of their game would be fashioned into ornaments and needles, and other articles. The further from good models they receded, the ruder would become the imitations and the workmen, until, when we arrive in the further limits, men would become such rude and clumsy artificers, that their tools would only bear comparison with those found among the diminutive Indians of the Rocky mountains and the inhabitants of Carpentaria. The question would be one of price to those within the limits of the then trade; and to those without it, it would be such a question as the introduction of a Schneider rifle to the inhabitants of the Victoria Nyanza; and, in fact, if we deduct our means and opportunities for intercourse, the introduction of bronze would not be unlike the distribution of the products of our civilisation in Africa and in Central Asia, and our evidence is abundant that such was the

case. At Nineveh, flint arrow-heads are found mixed with bronze weapons. The same in Egypt. The poorer Satrapies, as we have said, in the time of Xerxes, sent their levies armed with stone and flint. Throughout the wide archæological field of Scandinavia, Germany, Hungary, Gaul, and France, we find where there are bronze weapons there are generally stone ones too ; and I have many examples, if it were worth while quoting them. The Huns, we are told, used bone arrow-heads. The Anglo-Saxons used stone hammers at Hastings. The same weapons are said to have been used in the thirty years' war ; and are mentioned by Irish writers as in use there in the sixteenth century. Flints are still used by the remoter Laps, and by the Jews for circumcision. We are told that when bronze and stone are thus found together, it is a transition period ; this may be answered by the fact that bronzes of the finest workmanship are found among the very earliest of such relics, and a transition period surely demands a transitional condition of rudeness.

As the forests were cleared, as roads were opened up, as trade increased, and the Carthaginians, and the Greeks, and the Etruscans began to colonise, the luxury of the few would become the necessity of the many, and bronze would gradually drive out stone. But this would be progressive, and to fix an absolute date would be impossible.

From the way in which the early poets dilate on the beauty of its polished surface, a glitter not so easily dimmed as that of iron, we may suppose that this was one reason for the preference given to bronze. Another is to be found in the fact that, although iron is incomparably superior to it for weapons intended to cut, for those meant to thrust with only, bronze, hard and easily pointed, is by no means an inferior material. As we know, in the earlier times, the body armour was thick and heavy, and covered nearly all the vital parts, cutting with swords was then impracticable, and we never see it represented in the older sculptures, the thrust between the joints of the armour was the deadly method of despatching an enemy. As this heavy body armour was dispensed with, cutting edges became useful, and were, doubtless, introduced. We know from the pictures and sculptures of the Assyrians, the Greeks, and the Etruscans, that the lance and the pilum, rather than the sword, were the weapons in general use, and probably for this reason alone. The introduction of bronze at Babylon would follow closely on the discovery of its metallurgy ; into Greece, as soon as Cadmus and the heroes of an intangible tradition introduced culture there. Germany would probably have to wait till the Tuscan shore was colonised.

Britain may have remained without bronze till the black-cloaked Iberians had pushed ashore there. The dates of these events are beyond our ken, and in being unknown involve our ignorance of the earliest introduction of bronze. The use of iron, which is supposed to have displaced it, can be carried back to quite as early a date. It is mentioned with it in the *Pentateuch*, swords and axe-heads of it are found in Egypt and Assyria, and ancient mines of it are known in both countries. It is mentioned by Homer as occasionally used for weapons, and in the *Revue Archéologique* and the *Archæological Journal* may be found many instances of its discovery with stone, to the exclusion of bronze, especially in Russia, and the instances of stone, bronze, and iron occurring together are too numerous to detail. The reasons for its continued use when iron was known have exercised the ingenuity of many antiquaries.

Mr. Crawford, in a paper recently read before this Society, insists, with a clearness I cannot hope to rival, on the comparatively late discovery of the art of tempering as one reason for the late introduction of iron into general use, that it is highly improbable that bronze would have been used at all if a supply of steel had been available, and that the makeshift of a soft iron alone admitted of a profitable trade in bronze along the whole length of the Mediterranean. We find, however, that the method of tempering was almost as rude in the time of Pliny as in that of Job. We find, too, that Assyria, which was remotely situated in respect of a bronze supply, chiefly employed iron both for offensive and defensive weapons, and many such remains still exist; and we learn that in Xerxes' army their contingent was armed with clubs shod with iron, their other arms being like those of the Egyptians. Their bronzes are often alloyed with iron. Arrow-heads of the latter metal were found by Ouseley and Rich among the ruins of Persepolis. Iron was scarce in Egypt, and few weapons made of it are found in collections, yet in the paintings of the wars of Rameses II, we see arms figured as of two colours, blue and red, the former Sir G. Wilkinson considers to be iron, the latter copper or bronze.

Iron was well-known to the earlier writers of the Bible. The head of Goliath's spear was made of it; and in the *Pentateuch* it is spoken of as then used for chisels, axes, nails, and chariots. Homer tells us of arrows tipped with iron, of iron-shod clubs, and of iron axes and bills. In the *Odyssey* he tells us iron weapons were kept in a chest together with gold and brass ones. A lump of iron was one of the prizes at the funeral games of Patroclus. His epithet of "difficult to work" may add another reason for its somewhat limited use. The main reason,

however, I conceive to have been that bronze was, from its appearance and hardness, much more highly prized. In the neighbourhood of the sources of tin, it would be then cheap, and its remains are now abundant. When we recede from these centres, they become scarcer, as in ancient times *it* would become dearer. As the sources of tin were overrun by barbarians, or neglected from the decay of the Phœnicians, bronze would become very expensive, and iron would gradually supersede it; and when once superseded and the body armour discontinued, its reintroduction would be impracticable. It is interesting to trace the mention of its use among later authors. Pindar refers to brazen spears and axes; Sophocles describes Medea as cutting poisonous plants with brass razors; Xenophon speaks of brass scimiters; and Aristotle says that the wounds inflicted by iron are not so deadly as those caused by brazen weapons. Pausanias refers to brass weapons as archæological curiosities, and mentions several as preserved in the older temples. In Japan we are told that primitive stone hatchets are now revered in a similar manner.

The Etruscans, in early times, although working the mines of Etna, used iron but sparingly, and their arms are chiefly brazen. Pliny tells us that the armour of the Samnites was made of the same metal, and that the Campanians used shields and swords of brass. These were the Italians from whom the Romans, according to a scholiast on Sallust, derived their weapons. In the times of the kings they were thus armed. Pliny, on the other hand, quotes a treaty by which the Romans, at the instance of Porsena, agreed to discontinue the use of *iron* except for agricultural purposes. Niebuhr, on what authority I do not know, says that the Gallic war made the impoverished Romans replace their ancient weapons by new ones made of iron. On other grounds I have come to the conclusion that it was about this date that bronze was practically discontinued in Italy.

The Gauls, before attacking the Romans, had annihilated the Etruscan settlements in the Alps and Lombardy, they had overrun Southern Germany, and in doing so had undoubtedly cut off the Etruscans from the mines north of the Alps. They had also shattered to pieces their ancient power in Tuscany. This invasion would disturb the supply of tin and paralyse the local Italian trade in bronze, and necessity would compel the introduction of a substitute for it except for ornaments. If, as is probable at this early date, Greece was partially dependent on the same supply the same catastrophe would have the effect of introducing iron into more general use there also. The invasion of the Celts must have made itself felt in the remotest corners

of the Peninsula ; we know, at all events, that Spain soon became celebrated for its iron, and the Spanish sword was introduced into Rome, as is well-known, by Scipio. Bilbilis in Spain, and Noricum in Gaul, became celebrated workshops for this weapon. Polybius describes the Roman pilum and helmet as made of iron, and Pliny says that all the implements of war were then made of that metal. An iron crowbar was found in the hand of one of the skeletons at Pompeii, and the head of the pilum of the celebrated Roman sentinel found there was also made of iron. The equally celebrated sword of Tiberius found at Mayence, and now in the British Museum, is made of the same metal. An iron hatchet with a Roman inscription is figured in the *Revue Archéologique* for 1865, and three hundred and ninety-three iron heads of javelins were dug up in 1824 in the centre of a Roman intrenchment at Meon-hill in Gloucestershire. These instances might be accumulated *ad libitum* to prove the constant use of iron among the Romans. Not one well attested instance exists, that I am aware of, of the discovery of a bronze weapon of undoubted Roman origin ; indeed, I consider the argument of Sir John Lubbock on this question unanswerable. The only mention of the use of bronze in Roman times that I have been able to discover is an obscure statement of Strabo's, that the Lusitanian used bronze tipped javelins, and this statement is hardly corroborated by Diodorus. Quotations from the poets, who speak of brazen armour as ours do of the wooden walls of old England with a conventional taste and patriotism, are hardly of much value against such an array of evidence. Beyond the Roman world, the same change had taken place. The Gallic swords mentioned by Polybius as bending like strigils, were hardly made of bronze. Diodorus expressly states that the Gallic lankia, with blades a cubit long, were made of iron, as were also their swords. The Ædui under Tiberius are also described as using iron armour. These quotations will suffice. Our conclusion from them, and from other cumulative evidence, is that we may look upon the destruction of the Etruscan power in Italy and the advent of the Celtic tribes into the west as the era when the use of bronze was generally discontinued. In out of the way districts it may have survived somewhat longer, but I cannot bring myself to extend the period to a time when Roman influences were introduced there. To sum up in some measure the conclusions I have come to, I may say that I look upon the earlier culture of Europe as Phœnician and Semitic, and that it was *introduced* and not evolved out of the innate capacities and powers of its rude inhabitants. That the bright spots on the Mediterranean, whence that culture was dispersed, were so many colonies of

Phœnicia, *qua* that culture. That the manufacture of bronze and its dispersion formed one incident in the leavening of the primitive Europe with its advanced influence. And that the presence of a piece of bronze in an out of the way area is a mark of the extent to which the enterprise and commerce of Tyre had reached rather than any absolute test of the relative progress or the ethnologic affinities of such area. Lastly, that the use of bronze for cutting implements was practically discontinued in Europe somewhere about 350 B.C., while its introduction was dependent on the spread of geographical adventure by the Semitic race, whose earliest records mention it as known to them. In the great sources of tin, such as Spain, it must have been nearly coeval with its actual discovery.

In bringing this tedious paper to a close, I cannot help regretting the tentative nature of its conclusions, a quality which seems inseparable from archæological inquiries, which depend more upon a balance of evidence than upon experiment. I do not claim for it anything more than as containing the crude conclusions of inexperience, many of them, perhaps all of them, already forestalled, for I am but a gleaner on a well-harvested field. If I have added a small truth to the accumulated bundle of the world's knowledge, I shall be content, and shall feel that I have in some measure excused the presumption of addressing you.
